LORD LISTER.[1]

Introductory Remarks.

It is said that the Egyptian kings, after death, had to undergo a trial before they were embalmed. Our great men appear to be similarly arraigned, as their character and attainments are brought to judgment by the lesser ones of earth, who bear testimony concerning them, weighing them in their own balance, each to his entire satisfaction.

The reputation of the smaller great men may be affected by this judgment. The reputation of the truly great lies beyond the reach of blame or praise, and lives on in history after all those who have weighed them have been forgotten. Such was Lister.

Unlike the Egyptian kings, however, Lister was tried during life. His struggle with disease and with the mind of his fellow-men, though long and severe, was ultimately successful, and the great good achieved by the adoption of his methods was universally acknowledged. Whilst yet in the autumn of his life he was able to look on at the spread of the antiseptic system over ever-widening areas, and to rest in the consciousness that he had accomplished a great work for the good of mankind.

It would be out of place here to lay before you in their order the honours and titles showered upon Lister in the latter period of his life, or to refer to the impressive ceremony on the occasion of his funeral in the fane of the immortals—Westminster Abbey—save to remind you that, though the Abbey was open to receive his remains, the true man was shown in him when he directed that his body should be laid where his dust would mingle with the ashes of one he loved, and who had been his constant companion and helpmate during the most active portion of his life.

Lister's Early Days.

His Father, Joseph Jackson Lister.

Lister was blessed in his earlier days by excellent environment, well suited to one who was about to follow a scientific career.

His father, Joseph Jackson Lister, was a man of outstanding scientific merit. He left school at fourteen years of age, to assist his parent at the wine trade, in London, and though for many years closely tied down to business, he yet contrived, by early rising and otherwise, to gain free hours in which to supplement the education received at school, which, though sound, was insufficient for his needs. He was thus, in many respects, a self-taught man. He possessed extreme accuracy of thought, and was a most methodical worker, skilful with brush and pencil. As a microscopist he was the first to solve the problem of the achromatic lens, whilst many observations on zoophytes and ascidians were made by him—a paper on the former appearing in the Philosophical Transactions.

Here, then, was a man of grit, who left school at fourteen years of age to enter business in London, but who, by dint of his own exertion, found means to extend his scanty education, devoting what time he could to scientific pursuits with accuracy of thought and methodical work. Had it been in one's power to choose a father for Lister, one could not have chosen a man better suited to the purpose.

His Teachers and their Influence.

The influence of Sharpey upon young Lister was great. At University College he was guided by Sharpey to undertake important researches, which were continued by Lister after he had left London. Papers were written by him upon numerous physiological and histological subjects—such as the contractile tissue of the iris, an inquiry regarding the parts of the nervous system which regulate the contractions of the arteries, the cutaneous pigmentary system of the frog, the coagulation of the blood, the early stages of inflammation, &c. There also Graham aided him in the study of chemistry, and furnished his mind with a sound knowledge of its principles. In Edinburgh he studied under Syme, and became a great admirer of Syme's intellect and judgment, as well as of his skill as an operator. This intimacy ripened and lasted throughout the remainder of Syme's life.

All these men were the best he could have been educated under and associated with. The knowledge and experience gained from them admirably equipped him for the life of research which he was about to enter.

It is obviously impossible here to deal with all the periods of Lister's life, and therefore it has been deemed expedient to select one of these, and that the most vigorous of his career, when he evolved the theory of antiseptics, and when he had to defend his thesis.

Pre-Antiseptic Days.

In Lister's early surgical days in the Glasgow Royal Infirmary he encountered the same phenomena, which prevented the healing of wounds, in all hospitals throughout the world. Suppuration in wounds was the rule, and very profuse it generally was. Dressing of the wounds had to be done daily, and sometimes several times a day.

The handling of highly-inflamed wounds was a source of pain, and the dressing was anticipated by the patients with an apprehension akin to terror, especially as the exhausting process, with its accompanying high fever, reduced the resisting powers of the individual to a low ebb. The suppurative process invaded the deeper tissues, affecting the blood-vessels, and produced septic thrombosis, from which septic emboli were carried to distant parts. The effect of the dissemination of the septic material was soon shown in the high temperature, the violent rigours, the profuse sweats, the sweetish, sickening odour from the breath, the yellow cachexia, emaciation, and final delirium which all too frequently ended in death. Sometimes every patient in a ward who had a serious operation performed upon him would be swept away. The wards would then be emptied, lime-washed, well ventilated, and reopened, soon to be the scene of further pyæmic ravages.

All this was most depressing for the attendants, and many of the young student dressers had at times to retire to the restoring influences of the open air, and there debate within themselves whether it were physically possible for them to continue their work in the midst of such scenes of suffering.

Surgeons and patients alike dreaded operations, owing to their terrible results, and only operations of dire necessity were permitted to be performed. Severe compound fractures were treated by amputation of the limbs, as to attempt to save them was to court disaster. Consequently amputations in those days were common. It is impossible for students of the present day adequately to realise the conditions which previously existed.

Inflammation supposed to be necessary to Wound Healing.

Surgeons were ever at work, attempting to discover the cause of this excessive inflammation, and many were the theses and volumes written on the subject.

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[1] From a discourse delivered at the Royal Institution on June 7, 1912, by Sir William Macewen, F.R.S.

It was fully recognised that, if one could discover the cause of this excessive inflammation, it would be the first step toward eradicating the serious conditions attending wound healing. The minds of men, however, were obscured by an initial error of fundamental importance, which warped their vision, and for which the doctrine inculcated at the time was responsible. The error lay in the belief that, with the exception of healing by what was known as primary union, inflammation was necessary for wound healing, and that in the process of healing the phenomena of inflammation were always present.

Wound healing was treated in the text-books under the heading of inflammation. So that, instead of inflammation being regarded, *ab initio,* as a noxious process, it was looked upon as a necessary and beneficent one. It was only when it became excessive that it was regarded as baneful, and efforts were made to lessen it.

The trend of inquiry was therefore directed toward the elucidation of the phenomena produced by inflammation on the tissues, instead of endeavouring to discover the cause of inflammation and how it could be prevented.

Saviotti and Lister on the Nerve Control on the Blood-vessels in the Early Stages of Inflammation.

Much time was devoted by many observers to the elucidation of the effect of reflex action upon the blood-vessels, in the early stage of inflammation. The investigations of Saviotti[2] and Lister proved that reflex action, to which alone active hyperæmia had been previously attributed, was not the only factor in the production of increased local blood supply. From observation on the cutaneous pigmentary cells of the frog, it was evident that they were controlled by reflex action, as exhibited when the pigment in them contracted to the centre of the cell, under the influence of a beam of light, passing through the eye of the animal. It was also seen that limited areas could be taken out of the control of this general reflex action, by the application of certain irritants applied locally.

In order to account for this latter phenomenon, it was deduced that peripheral nerve ganglia must exist, having control of limited areas, and that when these ganglia were paralysed, they would no longer transmit the general nerve impulses.

Granting this conclusion, it was further deduced that a similar local nerve control might regulate the smaller blood-vessels under topical irritation of the parts and in the earlier stages of inflammation. If these ganglia were paralysed, the arteries would dilate, as is seen in active hyperæmia.

These communications were interesting and important, yet, though highly appreciated by all who valued science for itself and admired it for the truth it aimed at, they did not directly appeal to those who look lightly upon investigations the results of which are not immediately productive of direct and tangible benefits.

Microbes Discovered to be the Cause of Putrefaction and Fermentation (Cagniard-Latour and Schwann).

While darkness still brooded over the realm of medicine and surgery, notwithstanding endeavours to reach the light, investigations had been conducted in quite other fields, which were not only important in themselves, but were destined to lead to the revelation of multitudes of hitherto invisible organisms, everywhere existing, and playing a very potent part in the economy of the world.

More than thirty years previously, 1835–37, Cagniard-Latour in papers to the French Academy[3] recognised that alcoholic fermentation was due to the presence of a living organism. He found that grape-juice contained numerous globular bodies which he considered to be of vegetable nature, and which reproduced themselves by budding. These were always present when fermentation occurred, and in their absence fermentation did not take place.

In the following year, Schwann, of Berlin,[4] published the results of an investigation into the cause of putrefaction, in the course of which he also independently discovered the yeast plant.

What was of equal importance, he demonstrated that a putrescible fluid, such as a decoction of meat could be freely and indefinitely exposed to the action of pure air—air free from dust and organisms—without putrefaction ensuing in it.

Those views of Schwann that putrefaction is due to the action of living organisms, and those of Cagniard-Latour showing that fermentation is caused by the yeast plant, did not, for more than thirty years yield the fruit which, viewed from present knowledge, might have been expected from them.

Cagniard-Latour and Schwann's Observations confirmed by Pasteur, 1858.

Pasteur, when in the University of Lille, had abundant opportunity of studying alcoholic fermentation, as alcohol was the staple article of manufactur in that town. He became thoroughly convinced of the correctness of the observations and deductions previously made by Schwann and by Cagniard-Latour. He verified and extended those observations showing that fermentation was due to micro-organisms, and confirmed the observations of Schwann that pure air had no effect in producing putrefaction.

An Organism found to be the Cause of a Disease by Davaine, 1850.

In 1858 Pasteur reasoned from analogy that the relation of micro-organisms to disease was highly probable, and that the changes taking place in the secretion of a wound were probably due to a somewhat similar process to that of fermentation. The probability of micro-organisms being the cause of disease was greatly increased by a momentous discovery from a totally different quarter, an organism having been constantly found invading the tissues and blood-vessels of animals which had died of splenic fever. This was the *Bacillus anthracis,* discovered by two observers, Davaine[5] and Rayer in 1850 though it was ten years later before the complete identification of the relationship of this germ to the disease was definitely established.

Chronologically this was the first pathogenic bacillus discovered.

Other Theories of Fermentation.

Those observations and conclusions of Schwann, Cagniard-Latour, Pasteur, and Davaine were not generally known, and, where known, were not generally accepted, other theories being still in the field.

Besides the chemical theory of fermentation and putrefaction, the believers in heterogeneous and spontaneous generation were still many. Pouchet,[6] in 1859, made a systematised attempt to prove the possibility of spontaneous generation, and even after the antiseptic theory had been formulated, spontaneous generation was still advanced by Bastian[7] and other observers, who tried to demonstrate that vital force and living matter may arise *de novo* under the action of ordinary physical forces.

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[2] "Virchow Archiv," vol. i.

[3] *Annales de Chimie et de Physique*, t. lxviii., 2nd series, p. 206, 1838; *Comptes rendus*, t. iv., p. 905. 1837.

[4] *Poggendorff Annalen*, xli., p. 184, 1837.

[5] Davaine, "Recherches experimentales sur la Maladie Charbonneuse;" par H. Toussaint. (Paris: Asselin and Co.)

[6] Pouchet, "Heterogenie ou Traite de la Generation spontanée base sur des nouvelles experiences." (Paris, 1859.)

Tyndall, Huxley, and Ray Lankester against Spontaneous Generation.

Such writings had the effect of confusing the issue and diverting men's minds from the truth, and it was in no small measure due to the powerful help of Tyndall, Huxley, and Ray Lankester that the error was conclusively refuted.

Dr. E. Ray Lankester (NATURE, January 30, 1870) stated that he had performed numerous experiments with turnip solution, made under the conditions given in Dr. Bastian's book. No life was developed, a result contrary to that obtained by Bastian.

Prof. Huxley (NATURE, October 13, 1871) stated that he had seen Dr. Bastian's experiments and preparations, and expressed his belief that the organisms which Bastian got out of his tubes were exactly those which he put into them.

Tyndall, the illustrious predecessor of Sir James Dewar at the Royal Institution, submitted the question to fresh investigations. He had gone over the ground on which Bastian took his stand and was able to expose many of the errors by which experimenters were misled. One very beautiful and convincing experiment was introduced by Tyndall. He observed the fact that in a box the sides of which were coated with glycerine, all the particles of dust floating in the inside air fell and adhered to the glycerine in the course of a few days. The air is then *optically* pure. A transmitted ray of light tells the moment when this purity is obtained. Tyndall proved that to an eye rendered sensitive by remaining in darkness for a few minutes, the course of the ray is visible only so long as there are floating particles of dust capable of reflecting or diffusing light. On the other hand, the course of the ray becomes invisible to the eye as soon as the air has deposited all its solid particles.

When this deposition has occurred, any organic infusion may be introduced into the box and kept there without undergoing the least putrefactive or fermentive change, and without producing bacteria.

Lister Promulgates and Introduces the Practice of the Antiseptic Treatment of Wounds.

While professor of surgery in Glasgow, Lister was constantly speculating on the cause of inflammation and the cause of putrefaction in wounds, and during a discussion with friends, it was suggested to him that Pasteur's papers on fermentation might be of use in elucidating what seemed to be somewhat kindred processes. These papers of Pasteur came as a revelation to Lister, especially as he had not been cognisant of the observations made about thirty years previously by Schultze (1836), Schwann (1837), and Cagniard-Latour (1838), which had really laid the foundation of the germ theory and modern bacteriology.

The perusal of Pasteur's work threw a flood of light on the subject of decomposition in wounds, and Lister at once accepted the theory, and began a search for a something which would prevent the entrance of living organisms into wounds, believing that if such were found the healing of a wound would proceed "just as if it were subcutaneous."

About this time creosote—the active agent of which was carbolic acid—was used for disinfecting sewage, and Lister secured a sample of carbolic acid from Dr. Anderson, professor of chemistry in Glasgow University. He tried it in August, 1865, with results which justified his hypothesis.

In the wards of the Glasgow Royal Infirmary, which, previously, in common with other hospitals, had been the home of septic diseases, with their terrible issues, the introduction of the antiseptic treatment by Lister acted like the magician's wand, dispelling the horrors which previously accompanied wound-healing and creating an atmosphere of sweetness and health.

Difficulties in Accepting Antiseptic Theory and Practice.

The new treatment and the theory on which it was founded were received at first—save by a few faithful pupils—with scepticism and coldness, and later on with open hostility.

Germs in purulent wound secretions were not then demonstrated, and Lister was boldly called upon to show those organisms in such secretion before founding a theory and practice upon the assumption of their presence. This desirable demonstration was not obtained until later (1880–81), when Billroth and Ogston demonstrated the presence of organisms in pus taken from acute abscesses. Yet the deduction arrived at by Lister at that time, from the experiments of many able and trustworthy men of science, was not only permissible, but was the only one to which the data then available inevitably pointed.

Subsequent investigations with which all are now conversant abundantly proved the correctness of the conclusion.

The usual fate meted out to innovators or disturbers of settled doctrines was shared by Lister. He and his theory were virulently assailed both from within the hospital and from without. Some colleagues, some governors, and a host of freelances all joined in the fray, the most ignorant being ever the loudest. He was despitefully used, and had to bear the derision and cackle of fools. A scoffer has not necessarily a high standard of intelligence, and at best he does but devil's work. Fortunately such ephemera, troublesome and annoying as they are, die before the light.

Germany readily accepts Antiseptic Teaching.

Lister's teaching in this country was at first of no avail. It fell upon ears unprepared to receive it. Except by his own students in Scotland and a sprinkling of them in England, the antiseptic treatment passed unheeded over Britain, yea, even over the land of Pasteur it passed to other nations, especially to that country where the scientific education of its people, their earnestness of purpose, thoroughness of method, and their desire to see under the surface enable them to appraise quickly any theory and practice having a scientific basis.

Another reason for the rapid spread of antiseptics among the surgeons of northern Europe was that they bestirred themselves "to go and see" the practice first-hand. Thereafter they returned to their homes with a precise knowledge and a truer conception of the theory and practice than they otherwise could have had.

The influence of Danish and German testimony, corroborative of the value of the antiseptic treatment, made itself felt, and did much to render its adoption universal.

Pyogenic Organisms Discovered, 1880; *Organisms the Cause of Disease.*

The discovery of pyogenic organisms as the cause of suppuration in wounds was of great importance, as it demonstrated the correctness of Lister's theory and gave a tangible basis for the practice. It placed both the ætiology of suppuration and its treatment upon a scientific basis. Empiricism was in great measure overthrown, and henceforward a rational ætiology for disease and its treatment was sought. Microbiology, then in its infancy, received a great impulse, and fresh fields were opened from which an ever-increasing harvest has been reaped. From the burning plains and pestilential swamps of the tropics, to our own slums, with their three great D's—dirt, damp, and darkness, which we fondly harbour in our midst—disease after disease has been traced to its micro-organismal cause. Those diseases which remain will doubtless yield their secret to steady investigation, and would do so all the more readily if submitted to a properly constructed investigation department under scientific control.

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[7] Bastian, "The Beginnings of Life," 1872; "The Evolution and Origin of Life."

Tuberculosis, which for centuries was regarded as an hereditary disease, was shown to be germ-borne, common to man and to the lower animals, and to be intercommunicable between them. Cancer and sarcoma and the varieties included under these terms are doubtless also germ diseases, the germs of which are probably to be found near our everyday life, if our eyes were open to perceive them. The need of a scientific experimental investigation department under scientific control is all the more apparent as the Government has at last ventured to advance measures intended to mitigate one of the communicable diseases —tuberculosis.

Yet what the governing bodies do with the one hand they undo with the other.

For instance, in the old days the light that entered our houses was taxed, and the windows became smaller; to-day the powers that be tax the air contained therein, and for every cubic foot of air enclosed additional charge is made. In order to escape or to lessen this burdensome assessment, many huddle themselves and their families into dwellings of the smallest compass, where they inhale pre-breathed air, with the resultant lowering of vitality, germ-dissemination, disease, and death. Then we appoint commissions to find out the cause of the deterioration of the race!

Every man who is born has an inalienable right to as much fresh air as he is able to consume; but the "powers that be" say, "God may give you that right, but we shall tax you for using it." It is true that they do not as yet tax us for the amount of air we inhale out of doors, possibly because they do not know how to estimate the individual consumption. Yet the governing bodies are full of humanity and have the best intentions. When the ravages of tuberculosis can no longer be hidden, as it stares them in the face, they are moved to grasp at the first thing that appeals to them, and thev say to the affected, "Come, let us help you; we shall put you in sanatoria." What happens there? The patient has his birthright restored to him in being able to breathe the fresh air which God has meted out so freely, and for the use of which he was previously taxed.

Would it not be better to begin at the other end?—better to stop producing tuberculosis than merely to alleviate or to cure it once it has developed?

Modifications in Antiseptic Treatment.

Antiseptic treatment underwent many modifications. What was essential in the early days of its introduction became no longer necessary as the advance of knowledge brought clearer conceptions and paved the way for radical changes in the form of treatment. It became apparent that though strong antiseptics introduced into wounds destroyed organisms, they at the same time exercised an irritating influence on the living tissue, lowering its vitality, decreasing its resisting power, and increasing its secretions. To that extent the free use of antiseptics in the interior of wounds was detrimental.

Besides being harmful, they were unnecessary, as healthy living tissue of the interior of the body is free from germs, and pure air is innocuous.

Evolution of Aseptic Treatment.

As microbiology yielded its secrets, the bearing of germs and their products on the phenomena of disease ever became the clearer. The primitive conception of germs acting upon the human body just as they would in a laboratory test-tube was soon dispelled, and the multiplicity of the defensive reactions established by the living tissues for their own protection was recognised. It was seen that the microbic products excited the tissues to anti-bacillary action, and the elements of immunity, as we now understand it, were established.

The anti-bacillary phagocytic action of the living healthy tissue was demonstrated by the beautiful experiments of Metchnikoff, when it was seen that a certain number of organisms, brought into contact with the living tissue, could be destroyed therein by living cells. It also became obvious that the healthy living tissue in the interior of the body was inherently free from germs, and when wounded was capable of healing rapidly, and would do so if its vitality were preserved, and if germs emanating either from the abundant flora of the skin or from elsewhere could be prevented from being brought into contact with it.

This was effected by sterilising the skin and the instruments and all material brought into contact with the wound, without allowing antiseptics to invade the interior of the tissues.

It is upon such lines that aseptic treatment was introduced. Aseptic surgery was a natural evolution of antiseptic surgery—the one paved the way for the other.

The surgery of the present day involves the performance of painless, almost bloodless, operations, the wounds healing, as a rule, under a single dressing of the slightest description. Any material introduced into a wound for the arrest of hæmorrhage, or for bringing the parts together, is of a kind which, after its function has been performed, the living cells are able to remove. When the patient recovers from the effects of the anæsthetic his trouble is over. The film which covers the wound drops off of itself as soon as the phagocytes have completed their work of removing the deep part of the catgut stitches.

The air of cheerfulness in a surgical ward is now pronounced, the difficulty often being to persuade the patients to remain quiet for a ime sufficient to allow the internal parts to heal.

Advances consequent to the Introduction of Aseptic Surgery.

The introduction of aseptic surgery and the extension and more correct appreciation of bacteriological knowledge have enabled surgical procedures upon the human body to be greatly extended. The dangers arising from risk of wound infection being averted, many new devices have been practised for reaching the internal organs and for removing therefrom the products of disease.

Regions of the body hitherto considered too dangerous to be operated upon have now been successfully entered, and it soon became apparent that wherever diagnosis showed the presence of a serious pathological lesion, there the surgeon could follow, and where practicable eliminate it.

Since the introduction of asepsis and the consequent acquisition of extended and more definite pathological knowledge, the field of greatest surgical activity has been the abdomen—abdominal surgery, as we now know it, has been created. Tens of thousands—possibly millions—of human lives have been saved in this field alone, and the amount of pain and discomfort alleviated has been enormous.

Surgeons of all countries have contributed to this beneficent result, and have vied one with another in restoring health and comfort to the community, thus adding greatly to the economic prosperity of the nations.

Compound fractures, so fatal in pre-Listerian days, were not only robbed of their fatality, but surgeons became emboldened to make compound fractures for the rectification of malformation of the limbs.

Compound fractures, under the heading of osteotomies, have been performed aseptically in thousands—the bones healing aseptically. A portion of bone which has been fractured and displaced may be removed, placed in aseptic solution, pared, rearranged, and returned to its proper place in the body, where it will live and grow, and become restored to its functional use. Defects in the bone of one person may be made up by grafting on a portion of bone removed from another. A transplanted bone may be divided into little pieces, and a mosaic work of new bone may be placed in another animal to restore defects.

Asepsis, along with better knowledge of the physics of the pleura, has enabled surgeons to penetrate into the lungs and to remove therefrom pathological products, with a gratifying amount of success. Portions of lung have been removed, and several times the whole of one lung has been successfully taken away—the patients still continuing to enjoy life, working for their own living and one, at least, for that of his family.

Aseptic surgery has enabled operations upon the brain to be safely undertaken, and brain surgery has kept pace with the localisation of cerebral function. Its further development rests with the increase of precise data on that subject. Direct experiment on the brains of lower animals furnished excellent data on the localisation of the motor functions, but information as to the localisation of the higher intellectual functions must be gathered by patient clinical observation.

The discerning eye and the discriminating sense guiding the educated finger with its softness and lightness of touch have, under asepsis, carried out many operative procedures on diseased brains, where the tangled skeins of that delicate fabric have been unravelled.

Considering the delicacy of the organ, and the fact that in many instances life has been sapped at the governing centres of energy by the pathological lesions, operations on the brain have been very successful, many of them veritably snatching the patient from the brink.

The consummation of all that surgical activity has been attained by the introduction of aseptic practice, surgery having been re-developed since the introduction of Listerian principles and treatment.

Personal Teaching and Demonstration versus *Books.*

It is fashionable nowadays to decry university teachers and professors, many regarding them as an effete remnant of antiquity. It is contended that all that is required is to issue a paper or a book and allow the students to read at their own firesides instead of compelling them to attend lectures and demonstrations in a university.

It is true that formerly the teaching extended only so far as the teacher's voice could carry, but now one can write in one's own laboratory, and, if the message be important, it will be borne to the limits of the civilised world, and thus it is possible to instruct an audience of unlimited size.

There is, however, a difference between teaching by books and *viva voce* teaching and demonstration. Some things may be explained by means of clear writing and may be understood by correct reading, but there are other things difficult of comprehension in detail without the aid of practical demonstration. More especially is this the case when one has not the opportunity of personal contact with the introducer or with one who has seen his practice and followed his methods. No matter how well a statement may be written, impressions are drawn from it which differ according to the preparedness and previous experience of the mind of each individual reader. Personal observation produces a much more vivid impression and generally corrects individual misconstruction.

As professor of surgery in Glasgow, Lister followed the Scottish method, teaching the principles of surgery in the University, and afterwards demonstrating his methods in the wards of the infirmary. His lectures in the University and his observations in the wards were complementary to each other, and gave a groundwork more thorough than could otherwise have been obtained. Those who had been so taught found his methods simple and easy of execution, and were often astonished at seeing others less fortunate falling into serious errors in their attempt to carry out the antiseptic practice after reading Lister's papers alone.

There were many earnest men—professors of Continental universities, amongst others—who were well qualified to read correctly what had been written, yet who, having read, were not satisfied, but straightway desired to be brought into personal contact with the professor, in order that they might hear his teaching from his own lips and see the practice carried out by his own hands.

Prof. Saxtorph, of Copenhagen, was amongst the first of the many distinguished visitors to the Glasgow Royal Infirmary to see Lister's practice and to study his methods. After a few days he remarked that the seeing of the practice persuaded him of its feasibility, and that it then seemed much easier than it did when he had only read Lister's papers. So it was with many others.

Lister as a Scottish and as a London Professor.

Lister's teaching was more rapidly propagated among the students he had in Scotland than among the London students. The position which he occupied as a Scottish professor aided in this, as it was different from that held by him as professor of surgery in a London hospital.

In London in those days, the bulk of students desired, naturally, to take the membership of the College of Surgeons, and most teachers at that time taught to the requirements of the Board of Examination, otherwise their prelections were not specially sought after. In London, Lister was teaching a new doctrine, not yet generally homologated, and his wards were attended by few students compared with the numbers that surrounded him in the Scottish universities. On the other hand, Lister had less time to devote to the teaching of students, as London was more accessible to foreign visitors, and many of his days were devoted to demonstrations for their benefit.

As a Scottish professor, Lister's position offered the greatest advantage for the dissemination of his doctrines. He could teach his own students what he believed to be true, and, if necessary, teach them in advance of the time, as the teaching and the examination were both under his supervision. Hence Glasgow students were the first to become imbued with the spirit and to grasp thoroughly the principles of antiseptics, which they carried into practice. Scottish students thronged his wards and lecture-theatres in the infirmaries, an eager, critical, and ultimately an enthusiastic crowd, bringing inspiration to their teacher, whose principles and practice they afterwards bore to the ends of the earth, even before many examining boards were prepared to accept his teaching.

Lister's Influence on the Scottish Students.

Lister's presence in the Scottish universities was of the utmost value. By him teaching was maintained at a high level; he used the universities to stimulate thought, and therein aided them to perform their highest function. It was an inestimable blessing to a university to have such a man in it, and a priceless privilege to the students—to those of them who could appreciate it—to be allowed to stand silently by and watch the habit of mind and see how the brain worked. He was a man in earnest, and therefore he taught. His teaching was supported by direct appeal to nature. He accumulated data by observation and experiment, from both of which careful deductions were drawn. As a thinker, Lister did good by laying bare the difficulties he encountered in carrying out his projects, and his modes of overcoming these difficulties. In this way he stimulated and propagated the thinking faculties of the student. He showed his methods and thereby paved the way for others to follow.

In Glasgow Lister not only promulgated the theory of antiseptic surgery, but he worked out and thoroughly established its utility in practice, leaving behind him a body of enthusiastic disciples. After spending, as Regius professor of surgery, nine of the most active years of his life, and those fullest of scientific fruition, Lister passed quietly from Glasgow without public recognition of his services, the general body of citizens being unaware that a great scientific achievement had been wrought in their midst. It was long afterwards, when "all the world wondered," that Glasgow became alive to what it had possessed—and lost.

The Students' Appreciation of Lister.

As to the manner in which Lister was viewed by the Glasgow students, the following is an extract from a letter written me by a friend and fellow-student, which so well expresses my own views that I give it in his words:—

"We students were all very much impressed by the personality of Lister. His mild expression and his grave demeanour gave him benign dignity which could not fail to command respect. Even the impediment in his speech, which in another man might have been a source of annoyance to his hearers, seemed in his case only to add to the weight of what he said; and as he spoke slowly not a word of his lecture was lost. You remember how his students more or less unconsciously fell into a way of speaking which was a manifest echo of the master's voice. This affectation on the part of the students was simply an indication of the hero-worship which pervaded Lister's class, for there is no doubt we all idolised him.

"I understand it has been said of Lister that he was not a good lecturer, and that he was not a brilliant operator. You and I can laugh at such statements. Lister's lectures were all that could be desired. His subject-matter was always interesting—generally intensely so; his thoughts were clear and well defined, and he conveyed them to his hearers in choice and vivid language which left no doubt as to his meaning. As to his operating slowly, did he not tell us that the advent of anæsthesia by chloroform had rendered it unnecessary and undesirable to hurry through the work? Lister was thinking out and developing the antiseptic system at that time, and we were privileged to listen day by day as he informed us of his difficulties and how he proposed to overcome them; and so we watched the progress of those early stages which laid the foundation for the final triumph. . . . Above and beyond all petty details rises the towering personality of the man while the mind dwells fondly on the grandeur and beneficence of his achievements." (J. W. Allan.)

From another of Lister's Glasgow students, and one who was his house-surgeon in the Royal Infirmary, Dr. J. Coats (now Colonel Coats), who was among the first to practise antiseptic surgery in private, an interesting letter of reminiscences has been received, from which the following is culled:—

"One day when Lister was visiting his wards in the Glasgow Royal Infirmary, there was a little girl whose elbow-joint had been excised, and this had to be dressed daily. Lister undertook this dressing himself. The little creature bore the pain without complaint, and when finished she suddenly produced from under the clothes a dilapidated doll, one leg of which had burst, allowing the sawdust to escape. She handed the doll to Lister, who gravely examined it. then, asking for a needle and thread, he sat down and stitched the rent, and then returned the dolly to its gratified owner."

On one occasion on which Lister visited my wards in the Royal Infirmary, after he had been for some time in London, we were walking together from a ward in one part of the building to a ward in another, by means of a gangway of wood and glass, when Lister remarked: "Macewen, do you find this bridge a convenience to your work, for if so, you have to thank me, as I was instrumental in getting it put up?" I replied, "Yes, it is a convenience, but it is nothing compared to the greater gangway you provided, by which the patients after operation cross directly from the wards into the midst of life and health." I received a kindly look, a suppressed smile, and a pressure of the arm. . . .

In Edinburgh, though his system was met by some with determined opposition, it was adopted more or less thoroughly by others, and by many of the younger men enthusiastically. The students, though doubtful at first, began to observe his results, and soon became admirers of Lister and his work.

When Lister entered the clinical theatre of the old infirmary to deliver before a crowded audience his last lecture there, he was presented with a farewell address from the students. As he rose to reply, the air was rent with a rousing cheer that shook the building to its foundation. A cheer such as only British students—at rare moments—know how to give. It is spontaneous, and bursts like a blast from the throat of a whirlwind. Lister was fairly overcome. One who was near him, as a quiet observer, saw that he first became pale, and then a blush covered all his visible anatomy to the tips of his fingers. In a few moments he recovered, and said: "Gentlemen, I can recall my reception in the surgical theatre in Munich, on my visit to Nussbaum, where I was greeted with a German 'Hoch.' It was to me almost overpowering in its enthusiasm, but it was as nothing compared to this." (Dr. Young.)

That spontaneous outburst issuing from four hundred throats made amends for much. It was the laurel crown offered by the students. That rousing cheer reverberated through his whole being, and left such deep impression as doubtless would be with him to the end.

In the evening of his long life, when he stood apart from the honours which had been showered upon him, there remained to him the greatest of all rewards, a clear conscience and the knowledge that he had devoted his life to and had achieved a great work for the good of humanity.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

DR. A. D. ROSS, lecturer on natural philosophy in the University of Glasgow, has been appointed to the chair of mathematics and physics in the University of Western Australia.

AT a special meeting of the council of Hartley University College, Southampton, held on December 30, Dr. Alexander Hill, late master of Downing College, Cambridge, was unanimously elected principal at a salary of 1000*l.* a year.

MR. FRANK ROSCOE, who for the past twelve years has been master of method in the Day Training College of the University of Birmingham, has been appointed secretary of the Teachers' Registration Council.

THE general meeting of the Association of Public School Science Masters will be held at the London Day Training College, Southampton Row, W.C., on January 8 and 9; in connection with the meeting Dr. T. P. Nunn will deliver a series of addresses on the afternoons of January 6 and 7, upon "The Theory of Science Teaching, with Special Reference to the Conditions in Boys' Schools." On Wednesday, January 8, the president of the association, Sir Archibald Geikie, K.C.B., P.R.S., will deliver an address, and there will be a discussion upon the aims and uses of school science societies. On January 9 the subjects to be discussed are:—Practical examinations in science, the teaching of mechanics, and the value of presenting the historical aspect in teaching science. A paper urging that the teaching of density should be placed in the background and be superseded by the idea of "Roomage," or specific volume, will be read by Mr. G. F. Daniell.

WE learn from *Science* that by the will of the late Prof. Morris Loeb, formerly professor of chemistry in the New York University, large bequests are made to scientific and educational institutions. Subject to the life interest of Mrs. Loeb, 100,000*l.* is bequeathed to Harvard University for the advancement of physics and chemistry, 5000*l.* is left to the American Chemical Society for the establishment of a type museum of chemicals, to be established in the Chemists' Club of New York City, the U.S. National Museum, or the American Museum of Natural History, and 500*l.* is bequeathed to the National Academy of Sciences. The Hebrew Technical Institute receives 10,000*l.* The residuary estate, subject to Mrs. Loeb's life interest, is to be divided equally among the Smithsonian Institution at Washington and certain New York institutions, including the American Museum of Natural History, the Hebrew Technical Institute, and the Educational Alliance. The Smithsonian Institution receives its bequest to further the exact sciences. The American Museum of Natural History is to secure a collection for the illustration of the industrial use of natural products in ancient and modern times. The Hebrew Technical Institute is to establish technical courses for mechanics.

THE report of the hundred and sixteenth session of the Royal Technical College, Glasgow, which used to be known as the Glasgow and West of Scotland Technical College, is a record of satisfactory progress. The number of day students for the session 1911–12 was 572; of evening students, 4691; and of students in affiliated continuation classes, 8682. The college is therefore the centre of an organisation responsible for the education of 13,945 individuals. The corresponding number for the preceding session was 13,473. The increase in the number of day students was twelve. The roll of students contained the names of 157 graduates of the four Scottish universities, and of the Universities of Oxford, Cambridge, London, Manchester, Durham, Leeds, Sydney, Adelaide, Calcutta, Allahabad, and Heidelberg. Although seven large laboratories were provided for pure and applied chemistry in the new buildings recently opened, they have already proved insufficient, and, in consequence, an additional chemical laboratory, to accommodate seventy-two students, has been provided by transferring to the corridors on the same floor the contents of the museum of technical chemistry. Such rapid development of an industrial department is good evidence that the college maintains its position as possessing one of the leading schools of applied chemistry. The new lectureship in sugar manufacture, founded with the aid of subscriptions from firms and individuals interested in this industry, has been established. Proposals have been made for the establishment of a lectureship dealing with leather-tanning, but the governors are obliged to postpone taking steps in this direction until subscriptions are forthcoming to meet at least one-half of the probable expense, as was done in the case of the lectureship in sugar manufacture. In other departments of the college there are similar developments, and the report makes it clear that under its new name this Scottish technical college is entering on a career of increased usefulness.

SOCIETIES AND ACADEMIES.

LONDON.

Linnean Society, December 19, 1912.—Prof. E. B. Poulton, F.R.S., president, in the chair.—Cecil H. **Hooper**: Experiments on the pollination of hardy fruits, with observations on the insect visitors to the blossoms. Strawberries, provided there is wind, set fruit well without insects. Raspberries and loganberries set fruit imperfect in shape if insects are excluded. Currants and gooseberries, owing to the construction of their flowers and pollen, cannot be pollinated and set their fruit without the visits of insects. All these plants set fruit perfectly with pollen of the same variety or even of the same flower; but in the case of the apple, pear, plum, and cherry, this is not always the case, many varieties being self-sterile, and almost all produce more abundant and finer fruit with pollen of another variety. In these trees there is little transference of pollen by the wind, and even if a self-fertile tree is enclosed in muslin whilst in blossom (there being ample movement of the wind, insects only being excluded), it is the exception for any fruit to set; it is the same with gooseberries and currants. In trials with apples, only nineteen varieties out of sixty-five proved self-fertile; in pears, four out of thirty; in plums, twenty-one out of forty-one; in cherries, five out of twelve; whilst, when cross-pollinated, in three-quarters of the trials one or more fruits set on a truss. There seems to be a preference as to pollen, some varieties setting better with pollen of one variety than with that of another;